



REVOLUTIONIZING RENEWABLE  
TECHNOLOGIES

# Solar Thermal Heating Solutions

# About NuVision Renewables

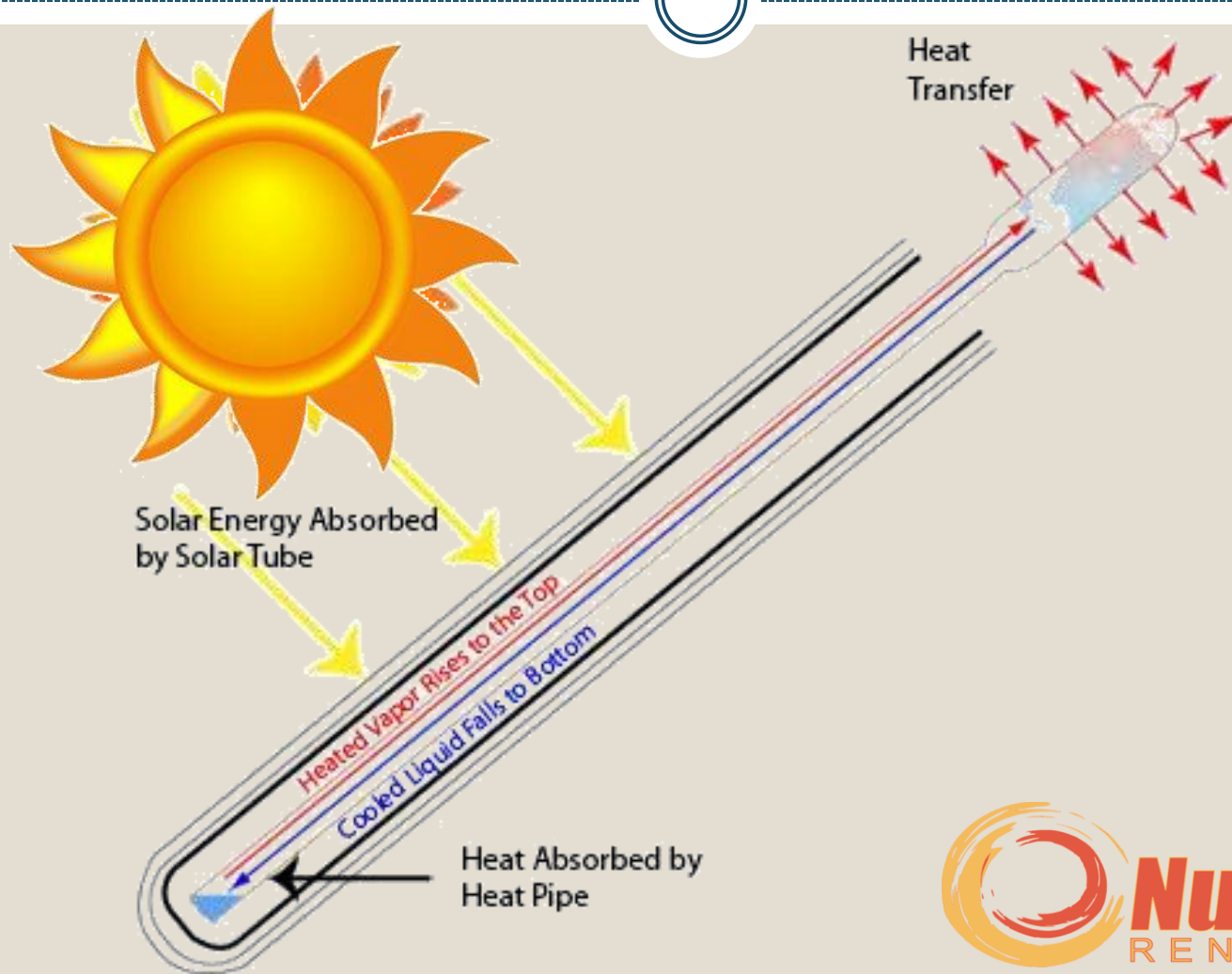


- NuVision Renewables' parent company FRCE has led the industry in innovative building design and implementation. In an effort to meet the ever-increasing energy demands FRCE began research into renewable energy sources leading to the creation of its NuVision Renewables division.

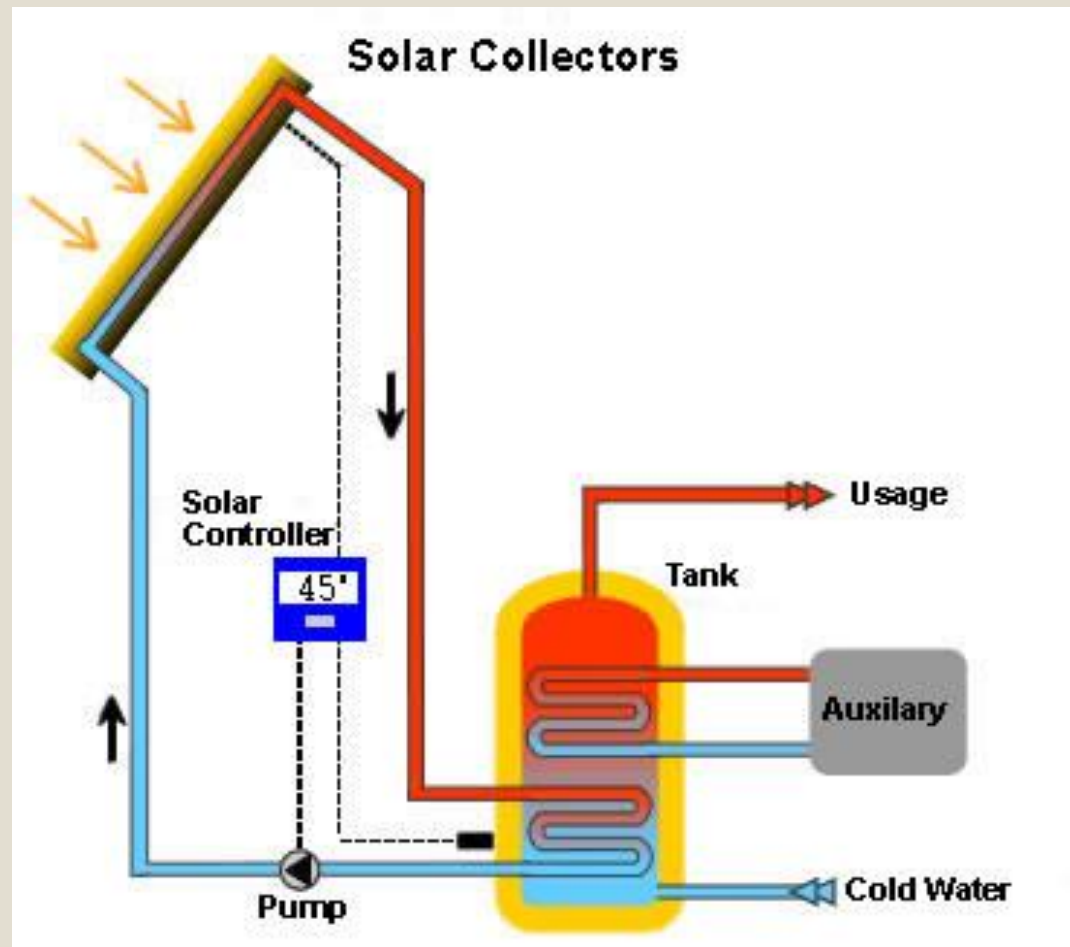
Solar energy is the cleanest, most abundant, renewable energy source available. Today's technology allows us to capture this power in several ways giving the public and commercial entities flexible ways to employ both the heat and light of the sun. NuVision Renewables has devoted countless hours to the research and development of our innovative solar collectors and corresponding solar equipment. This R&D has led us to discover many ways to enhance our current products, including the use of more technologically advanced monitoring and control systems.

NuVision Renewables offers solar thermal HVAC solutions. including radiant floor applications. We also offer unique product lines including solar attic ventilation equipment, solar pool heating, and solar photovoltaic products.

# Solar Thermal: How Does It Work?



# Solar Thermal: How Does It Work?



# Benefits of Solar Thermal



- Reduced costs of gas or electricity bills up to 60-80%!
- More than 25 years of life expectancy.
- Water Resistant.
- Increases the value of your property.
- Simple installation and non-invasive.
- Protection against rising cost of gas or electricity prices.
- Contributes to the environment. Reduces CO<sub>2</sub> emissions.

# Residential Applications



Ranch style home in East Central Indiana

## Problem

Electric baseboard heat was straining the family budget, with mid-winter costs above \$500 per month

## Solution

Solar thermal energy for primary source of forced air heating, 96% efficient boiler for secondary heat source.

# Ranch style home in East Central Indiana





# RETScreen for Project



## Emission Analysis

### GHG emission

|                                     |      |      |
|-------------------------------------|------|------|
| Base case                           | tCO2 | 19.3 |
| Proposed case                       | tCO2 | 7.2  |
| Gross annual GHG emission reduction | tCO2 | 12.1 |
| GHG credits transaction fee         | %    |      |
| Net annual GHG emission reduction   | tCO2 | 12.1 |

is equivalent to 2.2

Cars & light trucks not used

### GHG reduction income

|                           |         |  |
|---------------------------|---------|--|
| GHG reduction credit rate | \$/tCO2 |  |
|---------------------------|---------|--|

## Financial Analysis

### Financial parameters

|                |    |      |
|----------------|----|------|
| Inflation rate | %  | 4.0% |
| Project life   | yr | 20   |
| Debt ratio     | %  | 0%   |

### Initial costs

|                     |    |        |        |
|---------------------|----|--------|--------|
| Heating system      | \$ | 0      | 0.0%   |
| Other               | \$ | 30,000 | 100.0% |
| Total initial costs | \$ | 30,000 | 100.0% |

|                       |    |        |       |
|-----------------------|----|--------|-------|
| Incentives and grants | \$ | 15,000 | 50.0% |
|-----------------------|----|--------|-------|

### Annual costs and debt payments

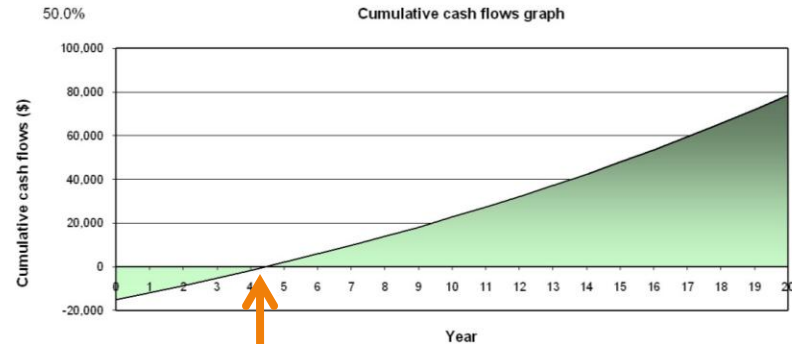
|                           |    |       |
|---------------------------|----|-------|
| O&M (savings) costs       | \$ | -260  |
| Fuel cost - proposed case | \$ | 1,656 |
| Other                     | \$ |       |
| Total annual costs        | \$ | 1,396 |

### Annual savings and income

|                                 |    |       |
|---------------------------------|----|-------|
| Fuel cost - base case           | \$ | 4,415 |
| Other                           | \$ |       |
| Total annual savings and income | \$ | 4,415 |

### Financial viability

|                      |    |       |
|----------------------|----|-------|
| Pre-tax IRR - assets | %  | 24.3% |
| Simple payback       | yr | 5.0   |
| Equity payback       | yr | 4.5   |



System Payback



# Industrial Applications



## FCC Indiana Industrial Process Water Heating

### Problem

1. 700 Gallon per Day Water Usage
2. Inbound water temperature- 65° F
3. Required water temperature- 125° F
4. Approximately 18 hours lost production time weekly

### Solution

- Solar thermal energy for primary source of water heating, 93% efficient boiler for secondary heat source.



# FCC Indiana Industrial Process Water Heating



# RETScreen for Project



## Emission Analysis

### GHG emission

|                                     |      |     |
|-------------------------------------|------|-----|
| Base case                           | tCO2 | 6.4 |
| Proposed case                       | tCO2 | 2.7 |
| Gross annual GHG emission reduction | tCO2 | 3.6 |
| GHG credits transaction fee         | %    |     |
| Net annual GHG emission reduction   | tCO2 | 3.6 |

is equivalent to 0.7

Cars & light trucks not used

### GHG reduction income

|                           |         |  |
|---------------------------|---------|--|
| GHG reduction credit rate | \$/tCO2 |  |
|---------------------------|---------|--|

## Financial Analysis

### Financial parameters

|                |    |      |
|----------------|----|------|
| Inflation rate | %  | 3.0% |
| Project life   | yr | 20   |
| Debt ratio     | %  | 0%   |

### Initial costs

|                     |    |        |        |
|---------------------|----|--------|--------|
| Heating system      | \$ | 0      | 0.0%   |
| Other               | \$ | 63,000 | 100.0% |
| Total initial costs | \$ | 63,000 | 100.0% |

|                       |    |        |       |
|-----------------------|----|--------|-------|
| Incentives and grants | \$ | 40,950 | 65.0% |
|-----------------------|----|--------|-------|

### Annual costs and debt payments

|                           |    |     |
|---------------------------|----|-----|
| O&M (savings) costs       | \$ |     |
| Fuel cost - proposed case | \$ | 365 |
| Other                     | \$ |     |
| Total annual costs        | \$ | 365 |

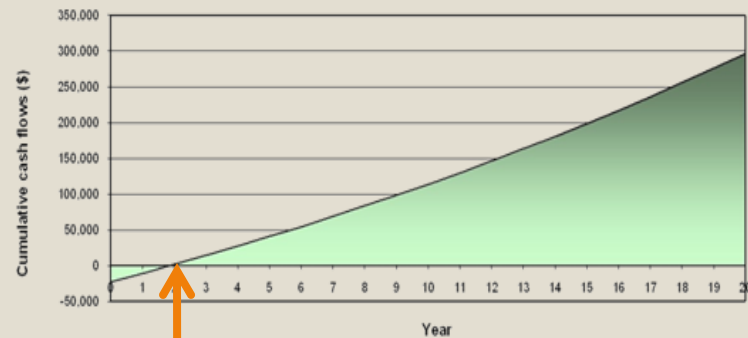
### Annual savings and income

|                                 |    |        |
|---------------------------------|----|--------|
| Fuel cost - base case           | \$ | 4,868  |
| Other                           | \$ | 7,000  |
| Total annual savings and income | \$ | 11,868 |

### Financial viability

|                      |    |       |
|----------------------|----|-------|
| Pre-tax IRR - assets | %  | 56.7% |
| Simple payback       | yr | 1.9   |
| Equity payback       | yr | 1.8   |

Cumulative cash flows graph



System Payback

# Commercial Application



12,000 Sq. Ft. building in central Ohio used for truck and heavy equipment repair and service.

## Problem

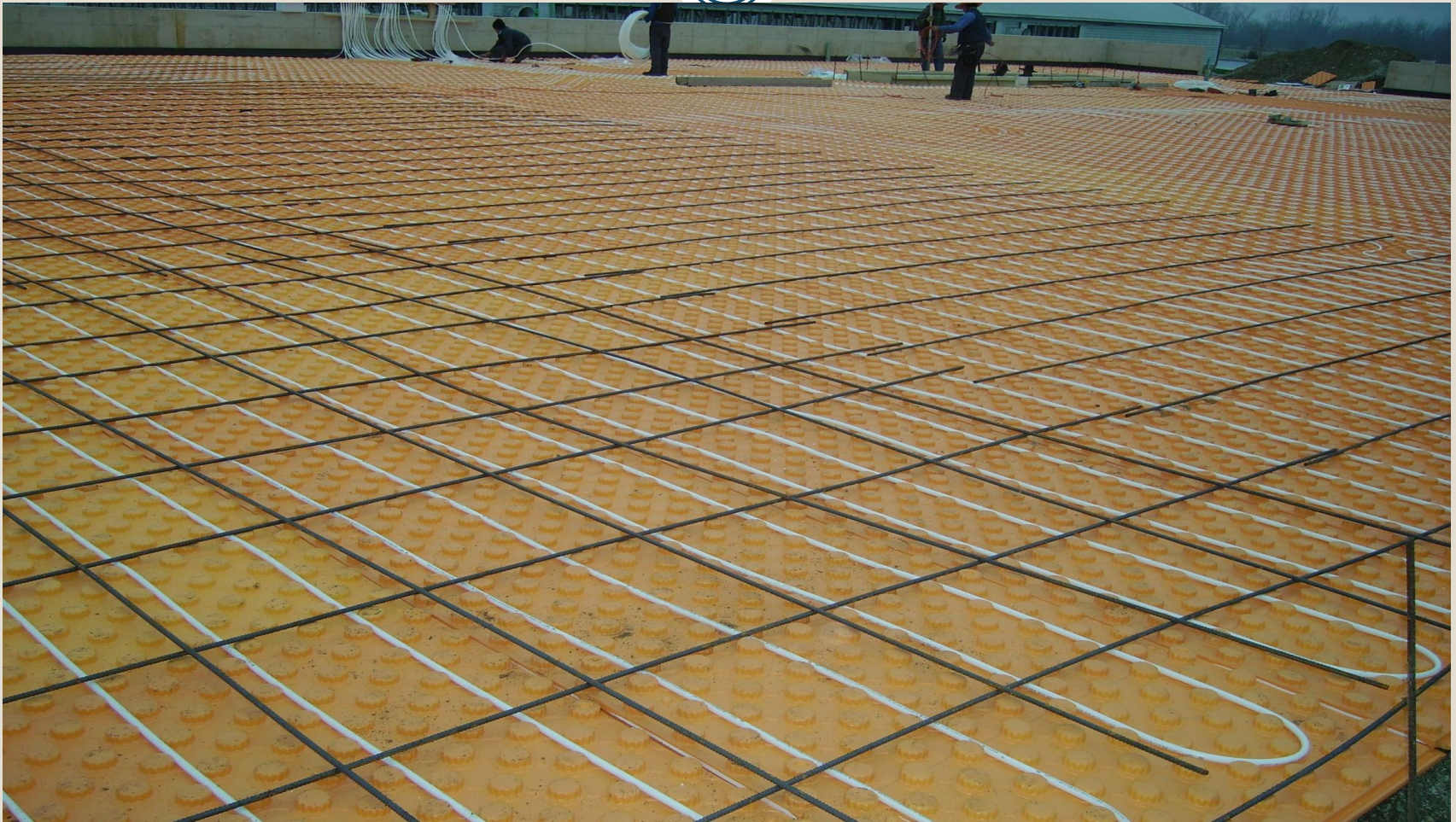
- 20 foot ceiling height made conventional heating extremely expensive.
- Cold concrete floor is uncomfortable and adversely affects worker performance

## Solution

- Radiant floor heat with solar thermal as primary heat source



# Radiant Floor Heating System



# RETScreen for Project



## Emission Analysis

### GHG emission

|                                     |      |      |
|-------------------------------------|------|------|
| Base case                           | tCO2 | 37.2 |
| Proposed case                       | tCO2 | 14.9 |
| Gross annual GHG emission reduction | tCO2 | 22.3 |
| GHG credits transaction fee         | %    |      |
| Net annual GHG emission reduction   | tCO2 | 22.3 |

is equivalent to 4.1

Cars & light trucks not used

### GHG reduction income

|                           |         |  |
|---------------------------|---------|--|
| GHG reduction credit rate | \$/tCO2 |  |
|---------------------------|---------|--|

## Financial Analysis

### Financial parameters

|                |    |      |
|----------------|----|------|
| Inflation rate | %  | 3.0% |
| Project life   | yr | 25   |
| Debt ratio     | %  | 0%   |

### Initial costs

|                     |    |        |        |
|---------------------|----|--------|--------|
| Heating system      | \$ | 0      | 0.0%   |
| Other               | \$ | 50,000 | 100.0% |
| Total initial costs | \$ | 50,000 | 100.0% |

|                       |    |        |       |
|-----------------------|----|--------|-------|
| Incentives and grants | \$ | 19,500 | 39.0% |
|-----------------------|----|--------|-------|

### Annual costs and debt payments

|                           |    |       |
|---------------------------|----|-------|
| O&M (savings) costs       | \$ |       |
| Fuel cost - proposed case | \$ | 3,836 |
| Other                     | \$ |       |
| Total annual costs        | \$ | 3,836 |

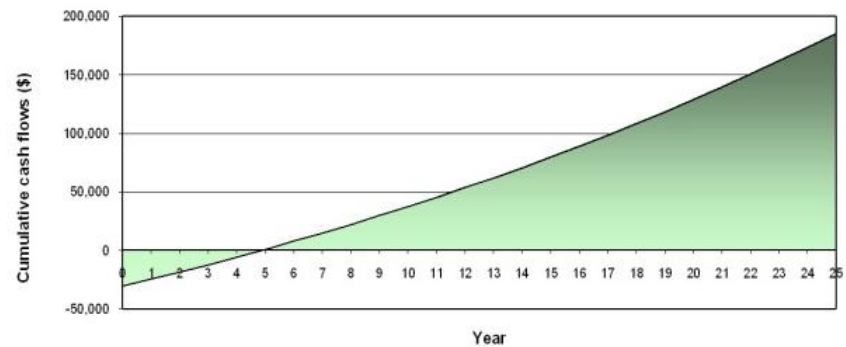
### Annual savings and income

|                                 |    |       |
|---------------------------------|----|-------|
| Fuel cost - base case           | \$ | 9,591 |
| Other                           | \$ |       |
| Total annual savings and income | \$ | 9,591 |

### Financial viability

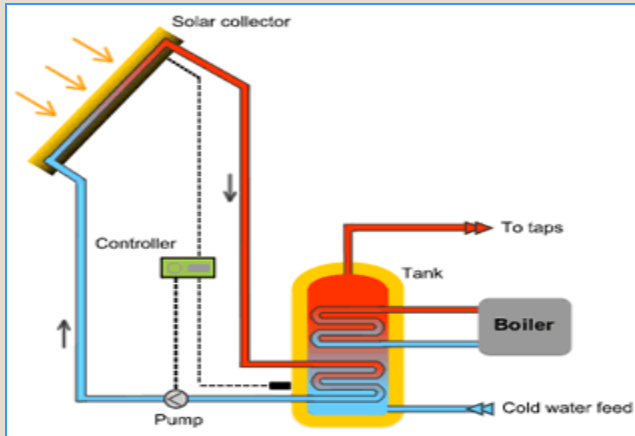
|                      |    |       |
|----------------------|----|-------|
| Pre-tax IRR - assets | %  | 22.2% |
| Simple payback       | yr | 5.3   |
| Equity payback       | yr | 4.9   |

Cumulative cash flows graph



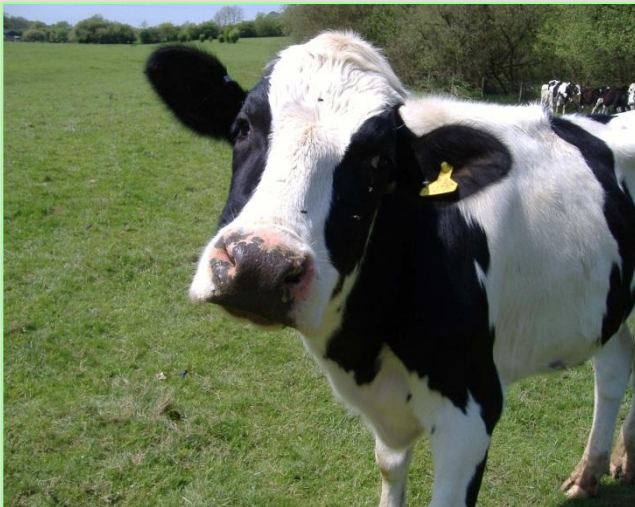


# *Solar Thermal Applications for Agriculture*



## Technical Characteristics

- Collector: Absorbs solar radiation and converts into heat
- Tank: Thermal storage container for collected thermal energy
- Pump: Device which allows the circulation of the thermal transfer fluid through heat collectors and exchangers
- Controls: Ensure the efficient and optimal operation of the system.



## Solar Applications in Dairy

Solar thermal systems can greatly contribute to energy savings during the production processes in the dairy sector, which demand water temperatures in excess of 180 °C.

The hot water produced by the solar collectors can also be used for washing down and sanitizing equipment and facilities.



# RETScreen for Agriculture Project

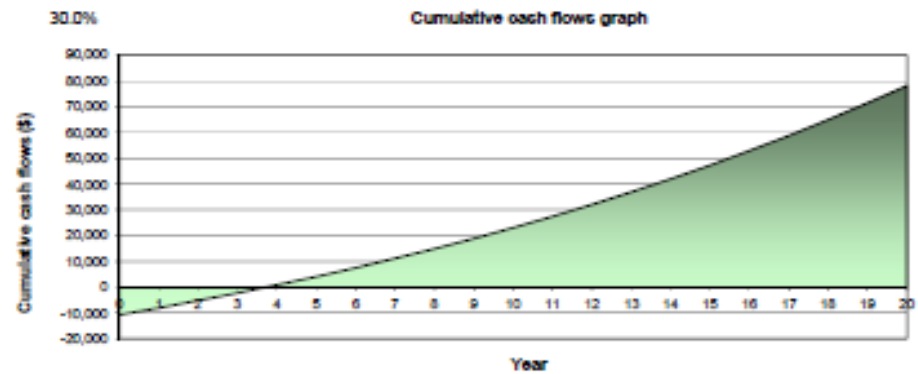


## Emission Analysis

|                                     |         |   |
|-------------------------------------|---------|---|
| GHG emission                        |         |   |
| Base case                           | 1002    | 9.7   |
| Proposed case                       | 1002    | 1.2   |
| Gross annual GHG emission reduction | 1002    | 8.5   |
| GHG credits transaction fee         | %       |   |
| Net annual GHG emission reduction   | 1002    | 8.5   |
|                                     |         | Is equivalent to 1.5 Cars & light trucks not used |
| GHG reduction income                |         |   |
| GHG reduction credit rate           | \$/1002 |   |

## Financial Analysis

|                                 |    |        |        |
|---------------------------------|----|--------|--------|
| Financial parameters            |    |        |        |
| Inflation rate                  | %  | 5.0%   |        |
| Project life                    | yr | 20     |        |
| Debt ratio                      | %  | 0%     |        |
| Initial costs                   |    |        |        |
| Heating system                  | \$ | 0      | 0.0%   |
| Other                           | \$ | 15,218 | 100.0% |
| Total initial costs             | \$ | 15,218 | 100.0% |
| Incentives and grants           | \$ | 4,570  | 30.0%  |
| Annual costs and debt payments  |    |        |        |
| O&M (savings) costs             | \$ |        |        |
| Fuel cost - proposed case       | \$ | 355    |        |
| Other                           | \$ |        |        |
| Total annual costs              | \$ | 355    |        |
| Annual savings and income       |    |        |        |
| Fuel cost - base case           | \$ | 2,917  |        |
| Other                           | \$ |        |        |
| Total annual savings and income | \$ | 2,917  |        |
| Financial viability             |    |        |        |
| Pre-tax IRR - assets            | %  | 29.9%  |        |
| Simple payback                  | yr | 4.2    |        |
| Equity payback                  | yr | 3.7    |        |



# Average Payback by Project



- Residential
  - 4.5 Years
- Industrial
  - 2 Years
- Commercial
  - 3-5 Years
- Dairy
  - 2-4 Years